PATENT ABSTRACTS OF JAPAN

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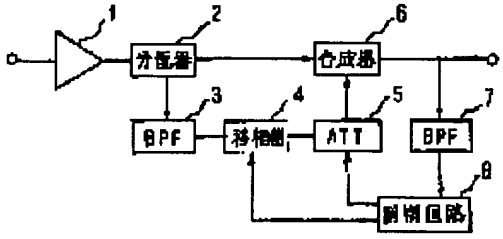
(54) HIGHER HARMONIC SUPPRESSING METHOD/CIRCUIT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method/circuit for suppressing a higher harmonic with high suppression effects over a wide band.

SOLUTION: A higher harmonic suppressing method is to distribute the outputs of an amplifier 1, which contains secondary higher harmonics to two outputs S1 and S2, to convert the secondary higher harmonic extracted from one output S1 by a first band-pass filter 3 with a phase shifter 4 and an attenuator 5, which are controlled by a control circuit 8, into a signal whose level is similar to the secondary higher harmonic of output S1 and whose phase differs 180 degrees and to put it together with output S2.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the harmonic restraint approach which controls the secondary higher harmonic included in an amplifier output, and its circuit.
[0002]
[Description of the Prior Art] the block diagram showing the configuration of the conventional harmonic restraint circuit where drawing 2 was indicated by JP,55-73115,A -- it is -- 11 -- a preamp and 12 -- the 1st splitter and 13 -- a phase shifter and 14 -- an attenuator and 15 -- a travelling-wave amplifier and 16 -- a high pass filter (HPF) and 17 -- the 2nd splitter ****. Next, actuation is explained. The input signal of angular frequency omega inputted into the preamp 11 is amplified to predetermined level, and in the 1st splitter 12, after being compounded with feedback harmonic content with an angular frequency of 2omega, it is inputted into a travelling-wave amplifier 15. Since it is operating on the level near saturation in order to acquire high efficiency, a travelling-wave amplifier 15 contains a higher harmonic, especially the 2nd higher harmonic in the modulated electron beam at abundance, RF energy conversion of it is carried out, and serves as the 2nd higher harmonic and is outputted. Thus, three waves of the 2nd higher harmonic wave generated in an input signal wave, a feedback higher harmonic wave, and the travelling-wave amplifier 15 interior exist in the interior of a travelling-wave amplifier 15, and it is amplified by the interaction with an electron beam. Then, lead to the external feedback circuit which took out only the 2nd higher harmonic and was equipped with the phase shifter 13 and the attenuator 14 with the 2nd splitter 17, and adjust the phase and amplitude of the above-mentioned feedback higher harmonic, and he makes it return from the output signal wave of a travelling-wave amplifier 15 to a travelling-wave amplifier 15 through the 1st splitter 12 of the above, and is trying to control the 2nd higher harmonic included in the output signal wave of a travelling-wave amplifier 15 in the above-mentioned example. In addition, the high pass filter 16 prepared in the preceding paragraph of the phase shifter 13 of the above-mentioned external feedback circuit carries out the operation which removes the basic signal wave of angular frequency omega among the signals which return to an external feedback circuit.
[0003]
[Problem(s) to be Solved by the Invention] By the way, in the conventional harmonic restraint circuit, the secondary higher harmonic is included in the output signal of a preamp 11 in practice. Therefore, an external feedback circuit will change the amplitude and phase of a secondary higher harmonic which were extracted from the output signal of a travelling-wave amplifier 15 to the secondary higher harmonic from the above-mentioned preamp 11, and the secondary higher harmonic generated with a travelling-wave amplifier 15, and will be made into the return signal. However, since the phases of the secondary higher harmonic included in the output signal of a preamp 11 and the secondary higher harmonic generated with a travelling-wave amplifier 15 differ Even if it erases the secondary higher harmonic included in the output signal of a preamp 11 by the secondary higher harmonic which returned The secondary higher harmonic generated from a travelling-wave amplifier 15 had the trouble that the secondary higher harmonic which cannot eliminate, therefore is included in the output signal of a travelling-wave amplifier 15 could not be reduced enough. Moreover, in the above-mentioned conventional high periphery tone control circuit, since the phase shifter 3 and the attenuator 4 consisted of passive circuits, they had the trouble of being unable to control a secondary higher harmonic on the same level over a broadband.
[0004] This invention was made in order to solve the above-mentioned trouble, and it aims at offering the high harmonic restraint approach of depressor effect, and its circuit over a broadband.
[0005]
[Means for Solving the Problem] After the harmonic restraint approach of this invention according to claim 1 distributes an amplifier output including a secondary higher harmonic to two, extracts a secondary higher harmonic from one output and adjusts the phase and amplitude of the above-mentioned

secondary higher harmonic further, it is characterized by controlling the secondary higher harmonic included in an amplifier output by compounding with the output of another side of the distributed amplifier.

[0006] The distribution circuit where a harmonic restraint circuit according to claim 2 distributes the output of amplifier and this amplifier, The filter which extracts a secondary higher harmonic from one output of the above-mentioned distributor, and the phase shifter which advances 180 degrees of phases of the secondary higher harmonic by which the extract was carried out [above-mentioned], It has the synthetic vessel which compounds the attenuator to which the amplitude of the above-mentioned secondary higher harmonic is changed, and the output of another side of the above-mentioned distributor and the output of the above-mentioned attenuator, and the secondary higher harmonic included in an amplifier output is controlled.

[0007] A harmonic restraint circuit according to claim 3 is equipped with the filter which extracts a secondary higher harmonic from the output of the above-mentioned synthetic vessel, and the control circuit which controls the above-mentioned phase shifter and the above-mentioned attenuator based on the output of this filter.

[0008]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. Drawing 1 is the block diagram showing the configuration of the harmonic restraint circuit concerning the gestalt of operation of this invention. The amplifier with which 1 amplifies an input signal, the distributor which distributes the signal by which 2 was amplified with amplifier 1 to two, The 1st band-pass filter with which 3 extracts a secondary higher harmonic from one output of a distributor 2 (BPF), The phase shifter which adjusts the phase of the secondary higher harmonic from which 4 was extracted with the 1st band-pass filter 3 and in which external control is possible, The attenuator with which 5 adjusts the amplitude of the output from the above-mentioned phase shifter 4 and in which external control is possible (ATT), The synthetic vessel with which 6 compounds the output of another side of a distributor 2, and the output of an attenuator 5, the 2nd band-pass filter with which 7 extracts a secondary higher harmonic from the output of the synthetic vessel 6 (BPF), 8 is a control circuit which controls the above-mentioned phase shifter 4 and the above-mentioned attenuator to control the secondary higher harmonic which detects the output of the 2nd band-pass filter 7, and is included in the output of the synthetic vessel 6, i.e., the output of a harmonic restraint circuit.

[0009] Next, actuation of the harmonic restraint circuit of the above-mentioned configuration is explained. Harmonic content (secondary higher harmonic) with one twice the frequency of signal frequency is contained in the signal amplified with amplifier 1 for the nonlinearity property of amplifier 1. A signal including this secondary higher harmonic is distributed to two by the distributor 2, one output S1 is outputted to the 1st band-pass filter 3, and the output S2 of another side is outputted to the direct composition machine 6. In the 1st band-pass filter 3 of the above, only the inner secondary higher harmonic of the inputted output S1 is extracted, and it is sent to a phase shifter 4. The secondary higher harmonic by which the extract was carried out [above-mentioned] is the secondary higher harmonic and this level by which the amplitude is contained in the above-mentioned output S1 (or output S2), and a phase is changed into the secondary (it was reversed) higher harmonic S3 which progressed 180 degrees rather than the above-mentioned secondary higher harmonic by the phase shifter 4 and the attenuator 5 which were controlled by the control circuit 8, and it is compounded with the output S2 of above-mentioned another side with the synthetic vessel 6 by them That is, in the synthetic vessel 6, since it denies the secondary higher harmonic and the above-mentioned output S3 which are included in the above-mentioned output S2 and suits when the above-mentioned output S2 and an output S3 are compounded, the secondary higher harmonic included in the output of the synthetic vessel 6, i.e., the output of a harmonic restraint circuit, can be reduced substantially. Here, a control circuit 8 detects the level of the secondary higher harmonic wave included in the output of the synthetic vessel 6 extracted with the 2nd band-pass filter 7, sets up suitably the amount of phase shifts, and the magnitude of attenuation to the above-mentioned phase shifter 4 and the above-mentioned attenuator 5, and is controlling them to reduce the level of the secondary higher harmonic wave included in the output of the

above-mentioned synthetic vessel 6.
[0010] According to the gestalt of this operation, the secondary higher harmonic which distributed the output of the amplifier 1 including a secondary higher harmonic to two, S1 and S2, and was extracted from one output S1 with the 1st filter 3 thus, with a phase shifter 4 and an attenuator 5 Since it was made to compound with the above-mentioned output S2 in the synthetic vessel 6 after changing into the signal with which 180 degrees of phases differ on the secondary higher harmonic wave and this level of the above-mentioned output S1 It can deny the secondary higher harmonic and output S3 which are included in the above-mentioned output S2, and can suit, and the secondary higher harmonic included in the output of the synthetic vessel 6, i.e., the output of a harmonic restraint circuit, can be reduced substantially. Moreover, since the above-mentioned phase shifter 4 and the above-mentioned attenuator 5 are constituted so that it may be controlled by the control circuit 8, they can control a secondary higher harmonic on the same level over a broadband.
[0011]
[Effect of the Invention] According to the harmonic restraint approach according to claim 1, as explained above, an amplifier output including a secondary higher harmonic is distributed to two, a secondary higher harmonic is extracted from one output, the phase and amplitude of the above-mentioned secondary higher harmonic are adjusted further, and since it was made to compound with the output of another side of the distributed amplifier, the secondary higher harmonic included in an amplifier output can be reduced comparatively substantially.
[0012] The distribution circuit where a harmonic restraint circuit according to claim 2 distributes the output of amplifier and this amplifier, The filter which extracts a secondary higher harmonic from one output of the above-mentioned distributor, and the phase shifter which advances 180 degrees of phases of the secondary higher harmonic by which the extract was carried out [above-mentioned], It has the synthetic vessel which compounds the attenuator to which the amplitude of the above-mentioned secondary higher harmonic is changed, and the output of another side of the above-mentioned distributor and the output of the above-mentioned attenuator. Since the secondary higher harmonic which reversed the secondary higher harmonic included in an amplifier output is generated and it was made to compound with an amplifier output, the secondary higher harmonic included in the output of a synthetic vessel, i.e., the output of a harmonic restraint circuit, can be reduced comparatively substantially.
[0013] A harmonic restraint circuit according to claim 3 extracts a secondary higher harmonic from the output of a synthetic vessel, and it can control a secondary higher harmonic on the same level over a broadband while it can reduce a secondary higher harmonic certainly, since it was constituted so that a phase shifter and an attenuator might be controlled based on this filter output. .

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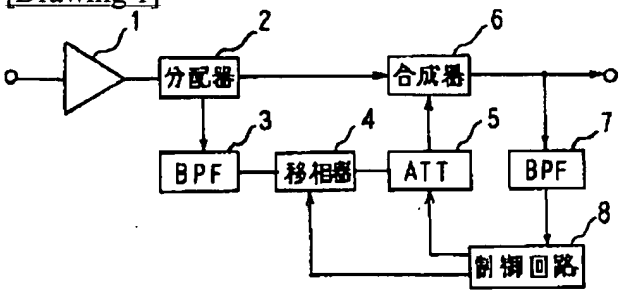
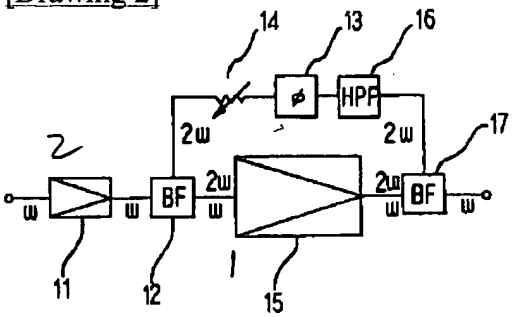
DRAWINGS

[Drawing 1]



[Drawing 2]



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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the harmonic restraint equipment concerning the gestalt 1 of operation of this invention.
[Drawing 2] It is the block diagram showing the configuration of conventional harmonic restraint equipment.
[Description of Notations]
1 Amplifier, 2 Distributor, 3 1st Band-pass Filter, 4 Phase Shifter, 5 Attenuator, 6 Synthetic Vessel, 7 2nd Band-pass Filter, 8 Control Circuit

[Translation done.]